REMARKS

The August 27, 2003 Official Action and the reference cited therein have been carefully reviewed. In view of the amendments presented herewith and the following remarks, favorable reconsideration and allowance of this application are respectfully requested.

At the outset, Applicants note that the Examiner has indicated that claims 4, 24-28, 35 and 36 are deemed free of the prior art given the failure of the prior art to teach or reasonably suggest the subject matter encompassed by these claims.

At page 2 of the Official Action, the Examiner contends that original claim 1 is drawn to many sequences, including variants from an undisclosed number of plants and again reiterates that Simon et al. reads on the claimed invention. Claim 1, as filed is directed to an isolated nucleic acid obtainable from the **FRI locus** of a plant. The constans gene described by Simon et al. does not reside at this locus and thus this reference cannot be said to read on the subject matter claimed. Accordingly, the Examiner's reliance on this reference to support a lack of unity holding in this application is clearly in error. Inasmuch as the claims indisputably possess a special technical feature, Applicants again request reconsideration of the restriction requirement set forth in Official Action of May 14, 2003.

The Examiner has objected to the specification for containing embedded hyperlinks. The disclosure has been amended to remove this subject matter, thereby rendering this objection moot. The first paragraph of Examiner 5 has also been amended to clarify the meaning of the paragraph. Finally, claims 4 and 9 have been amended such that they no longer read on a non-elected invention.

At page 4 of the Official Action, the Examiner has rejected claims 1-10, 18, 20-28, 35 and 36 under 35 U.S.C. §112, second paragraph as allegedly indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention.

Claims 1,2, 5-10, 18, 20-28, 35 and 36 stand rejected under 35 U.S.C. §112, first paragraph as allegedly containing subject matter which was not described in such a way as to reasonably convey to one of skill in the art that the inventors had possession of the invention at the time the application was filed.

The Examiner has also rejected claims 1-10, 18, 20-28, 35 and 36 under 35 U.S.C. §112, first paragraph asserting that the claims are not fully enabled by the disclosure in the application.

At page 11 of the Official Action, the Examiner has rejected claim 22 under 35 U.S.C. §112, first paragraph, asserting that undue experimentation would be required to practice the subject matter encompassed by this claim.

Claims 1-10, 18, 20, 22, and 23 stand rejected under 35 U.S.C. §102(b) as allegedly anticipated by Schmidt et al.

The objections and rejections summarized above constitute the entirety of objections and rejections raised by the Examiner in the August 27, 2003 Official Action. No other issues are pending in the present application. Applicants respectfully submit that the claims as presently amended are in condition for allowance. Each of the above-noted objections and rejections under 35 U.S.C. §§ 112, first and second paragraphs and 102(b) is, therefore, respectfully traversed.

THE METES AND BOUNDS OF CLAIMS 1-10, 18, 20-28, 35 AND 36 AS AMENDED ARE CLEAR TO ONE OF ORDINARY SKILL IN THE ART

The Examiner has rejected claims 1-10, 18, 20-28, and 35-36 under 35 USC §112, second paragrah for alleged indefiniteness.

The relevant inquiry in determining whether a given claim satisfies the requirements of 35 U.S.C. §112, second paragraph, is whether the claim sets out and circumscribes a particular area with a reasonable degree of precision and particularity such that the metes and bounds of the claimed invention are reasonably clear. In re Moore, 169 U.S.P.Q. 236 (CCPA 1971). Applicants respectfully submit that with respect to claims 1-10, 18, 20-28, 35 and 36 of the present application, such inquiry must be answered in the affirmative.

The definiteness of claim language may not be analyzed in the abstract, but must be considered in light of the teachings of the prior art and of the particular application disclosure, as it would be interpreted by one having ordinary skill in the art. In re Moore, supra.

Specifically, the Examiner asserts that the claims are unclear for the following recitations:

i. The metes and bounds of the term "obtainable" in claim 1 have not been defined.
ii. In claim 1, "FRI Locus" has not been defined, nor have the applicants defined what nucleic acids are encompassed in the recitation "FRI locus."
iii. The metes and bounds of "capable" in claim 1 have not been defined.
iv. In claim 1, the term "altering" is unclear, as is how flowering time is changed.

v. In claim 3, it is unclear whether or not SEQ ID No. 1 is intended as a claim limitation, and further all recitations in which "SEQ ID NO:#" is set in parentheses are rejected.

vi. In claim 5, the specific meaning of the word "homologous" has not been defined.

vii. In claim 8, the metes and bounds of "orthologue" has not been defined.

viii. In claim 10, 2nd line, the word "is" is missing.

ix. In claim 23, the metes and bounds of "containing" have not been defined, and it is unclear in what capacity a host cell contains the nucleic acid of claim 1.

x. In claim 24, the recitation "optionally present in a plant" is unclear.

xi. In claim 25, 3rd line the word "and" is missing.

xii. In claim 26, a phrase is grammatically incorrect.

xiii. In claim 27, items are incorrectly designated or implied to be plants.

xiv. In claim 27, 4th line, the word "and" is missing.

xv. In claim 28, 1st line, the article "a" is missing.

xvi. In claim 28, the metes and bounds of "propagule" are not defined, as for example, with respect to how many cells constitute a propagule.

xvii. In claim 35, the metes and bounds of "influencing" and "affecting" have not been defined.

xviii. In claim 36, 3rd line, the word "which" is superfluous.

The claims have been amended as set forth below to clarify the metes and bounds of the subject matter encompassed thereby.

"Obtainable" in Claim 1 has been replace with the term "obtained". One skilled in the art would know whether or not nucleic acid had been obtained from the FRI locus.

The FRI locus is fully described in the specification and has been defined by mapping, which is provided in detail in Example 1 with reference to Figures 1 to 3. It segregates as

a single locus (page 30, lines 24-25) and contains the *FRIGIDA* gene. Claim 1 has been further amended to delete the terms "Capable" and "altering".

All Figure numbers have been replaced with SEQ ID NOS and the parentheses have been removed from the pending claims.

The term "Homologous" in Claim 5 has been deleted.

The phrase "FRI orthologue" in Claim 8 refers to a FRI gene isolated from the FRI locus in a plant species other than *Arabidopsis thaliana*.

In Claim 10, 2nd line, the word "is" has been inserted after "which".

The term "containing" has been deleted from claim 23.

The phrase "optionally present in a plant" in Claim 24 has been deleted. New dependent Claim 41 has been added to cover the cell being present in a plant.

Claim 25 has been amended to include the word "and".

The phrase "which is a clone, or selfed or hybrid progeny or other descendant" in Claim 26 has been replaced with "progeny thereof". This phrase encompasses a clone, selfed or hybrid progeny or other descendant.

Claim 26 claims a plant, and claim 27 is limited to a number of possible types of Brassica ssp. e.g., "Brassica napus" and "culinary herb". These are valid limitations for a dependent claim, and do not make the claim unclear. Claim 27 has been further amended to include the word "is".
The term "Progagule" is explained on page 21, lines 11-14. It includes cuttings and dispersive structures such as seed, fruit, gemma or spores of the parent plant. The number of cells contained in a propagule is irrelevant to the claim.
The typographical error Claim 28 has also been corrected, so that it now reads "A part or a propagule...". Basis for the correction can be found at page 21, lines 11-16.

Claim 35 has been amended to deleted the terms "influencing" and "affecting".

The second occurrence of the term "which" in claim 36 has been deleted. Also, minor grammatical and formatting amendments have been made in response to the other points raised by the Examiner.

In light of the foregoing remarks and claim amendments, the metes and bounds of the claims would be readily apparent to one of ordinary skill in the art. Accordingly, it is requested that the rejection of the claims under 35 U.S.C. §112, second paragraph be withdrawn.

THE CLAIMS AS AMENDED FULLY SATISFY THE WRITTEN DESCRIPTION REQUIREMENTS OF 35 U.S.C. §112, FIRST PARAGRAPH

The Examiner objects that the specification does not indicate that the applicant had possession of the invention at the time of filing, with reference to SEQ ID NO: 2 and variants thereof.

Sequences of genomic DNA from FRI (SEQ ID NO: 2), FRIGIDA cDNA (SEQ ID NO: 3) and amino acid sequence are provided in the specification. Thus, the claimed protein and nucleic acid are precisely defined by their sequences. The applicant was therefore clearly "in possession of" these sequences at the time of filing.

Regarding variants, the claims are now amended to recite 90 % identity, thus restricting the claims to variants having a very close relationship to (SEQ ID NO: 2).

The Examiner objects that the written description requirement is not satisfied because one of skill in the art would not be able to identify sequences with less than 100 % identity that still maintained the claimed activity. However, in fact, methods of identifying variants are routine in the art and pose no difficulty to the skilled person. The skilled person can straightforwardly identify variants using well-known methods, examples of which are given in the specification. For example, page 5 describes mutagenesis of

known sequences, following which the mutant sequence can be tested for activity to determine whether it is a variant within the scope of the claim. Other methods include homology searching (see page 8), and identifying naturally-occurring variants from plants using probe hybridization (see pages 9-11). Because of the functional limitations in the claims, the claims do not cover variants that lack the "proper activity", and activity can and would be routinely determined by the skilled person whenever a potential variant is identified.

The Examiner also objects that the applicant does not disclose a representative number of variants. The invention claimed is defined with reference to a given sequence and a function. As explained above, the skilled person can straightforwardly identify variants falling within the claims: there is no undue experimentation required, only standard techniques.

Therefore, considering:

- the routine methods of identifying variants;
- the functional characteristics of the variants claimed;
- the defined structure of the sequences provided; and
- the fact that mutagenesis, homology searching and hybridization are all well-developed technologies,

then one of skill in the art would recognize that variants falling within the claims are implicitly disclosed as a result of the isolation and characterization of nucleic acids from the FRI locus.

To gain a reasonable protection for the invention, the applicant should be allowed claims that cover the disclosed sequence plus very similar variants. It is well known that conservative substitutions can be made in a protein by changing the encoding nucleic acid so that a different but similar amino acid is inserted in the polypeptide sequence.

Sometimes, such a point mutation destroys the function of the protein, but this is rare and non-functional variants are excluded by the functional limitation in the claim. Normally, a point mutation has no significant effect on protein function (see Bowie *et al.*, p. 1306, right column, cited by examiner). Therefore, the skilled person can readily envisage variants of SEQ ID NO: 2 that would be fully functional but that would have a slightly different sequence to the one shown in the application. The applicant should reasonably be allowed to protect such simple sequence variants, and therefore favorable consideration of the claims, especially Claim 5, is requested.

New Claim 42 also relates to variants. The examiner will note that the language of this claim is based even more closely on Example 9 of the Synopsis of Application of Written Description Guidelines promulgated by the USPTO, where the example claim is said to meet the written description requirement. Claim 42 has basis in the specification on, for example, pages 9-13. Highly stringent conditions are defined on page 12 lines 4-10.

In light of the foregoing remarks and amendments, Applicants submit that the rejection of the claims for inadequate written description is improper and should be withdrawn.

THE CLAIMS AS AMENDED ARE FULLY ENABLED BY THE SPECIFICATION AS FILED

Claims 1-10, 18, 20-28, 35 and 36 stand rejected under 35 U.S.C. §112, first paragraph as allegedly lacking sufficient enablement. The Examiner objects that the applicant has not taught how one skilled in the art can make and/or use the claimed sequences to affect, influence or alter flowering time in a plant.

The claims are now limited to acceleration or delay of flowering time, rather than alteration in general. Also,

Claim 5 now recites sequences having 90% sequence identity to SEQ ID NO: 2.

The effects of FRI locus nucleic acid have been studied and are known to affect flowering time (see page 2 of the application, for example). This is good reason to believe that transformation with FRI locus nucleic acid will produce the claimed effects.

The application provides instructions on how to transform plants with the claimed sequences and how to measure flowering time (e.g. pages 3, 19-20 and 40). Transformation of plants can have variable effects, as the examiner points out. This is true of any biological system - variation is inherent in the nature of the art. When producing transgenic plants, it is normal practice to transform a large number of plants and then to select those displaying the desired effects. Almost certainly, the method will not be successful in every plant, and variation is expected. The experimentation required for successful transformation is normal in the art and is not undue. On the contrary, the variability of the technique is recognized and compensated for by one skilled in the art.

In In re Wands, 8 USPQ2d 1400 (1988), cited by the examiner, the Federal Circuit Court of Appeals held that engagement in experimentation to practice a claimed invention does not render the disclosure non-enabling as long as the experimentation required is not "undue". The Court stated that: "The determination of what constitutes undue experimentation in a given case requires the application of a standard of reasonableness...The test is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed" In re Wands, 8 USPQ2d 1400, 1404 (1988).

In the present case, the experimentation necessary is

merely routine and is inherent in the nature of the art. Therefore, there is no undue burden of experimentation and the claimed subject matter is enabled.

The Examiner's attention is also respectfully drawn to In re Angstadt and Griffin, 190 USPQ 214 (CCPA 1976) wherein the Court held that an applicant need not demonstrate the operability of each and every species covered by a claim and that patentable claims may cover inoperable species. In the present situation, the skilled person knows how to ensure successful operation of the claimed methods and can readily find embodiments in which the method will work, so that occasional failure of the claimed methods does not mean that the claim as a whole is non-enabled.

The Examiner queries the effect of enhancers, suppressors and other factors that might affect flowering time, with reference to Clarke *et al*. Certainly, the genetic background of a transformed plant may influence its phenotype. However, this variable is known and recognized by the skilled person, so that it can be taken into account and controlled, for example by selection of plant material. The specification teaches that there are other genetic factors, e.g., VRN2, that also influence flowering time and may interact with FRIGIDA. These influences mean that a greater variation in flowering time is achievable so, for example, transformation is likely to produce some plants showing a greater delay in flowering compared to others.

These variables do not mean that the claimed methods will not work, or that the nucleic acids cannot have the claimed effects. Clarke *et al*. actually notes that "The *FRI* locus, therefore, appears to be a major determinant of flowering time...and may be the locus having the greatest effect on flowering time in *Arabidopsis*." Other known factors are taken into account by one skilled in the art, and so their influence can be controlled. Therefore, the teaching in the application

is sufficient to enable one skilled in the art to make and use the claimed invention.

The Examiner also objects that functional variants of (SEQ ID NO: 2) are not enabled, and refers to Bowie *et al.* Bowie, as discussed above under 'written description', teaches that "proteins are surprisingly tolerant of amino acid substitutions" (page 1306, right column). Accordingly, the skilled person can readily obtain variants by, for example, mutagenesis of the amino acid sequence. The skilled person can ensure production of a functional variant by testing the mutant sequences for function. If, by chance, mutagenesis does destroy protein function, then the nucleic acid is outside the scope of the claim. As noted above, a claim may be patentable even if some experimentation is required, so long as the experimentation is not undue. In the present case, well-known techniques are available for identifying the claimed variants, and no undue experimentation is required. Non-functional mutants will be relatively rare, and can in any case be discarded following testing for activity. Therefore, the claimed subject matter is enabled and the rejection under 35 U.S.C. §112, first paragraph should be withdrawn.

CLAIM 22 AS AMENDED IS FULLY ENABLED BY THE DISCLOSURE IN THE SPECIFICATION

The Examiner objects that claim 22 is not enabled because homologous recombination is unpredictable in plants. The skilled person faces no difficulty in carrying out the method of claim 22 to transform a plant cell, because technique of transformation using *Agrobacterium tumefaciens* is well-established. Transformation using *A. tumefaciens* results in recombination and integration of the vector into the plant genome and thus Applicants submit that undue experimentation is not required to practice the method encompassed by claim 22. Accordingly, the rejection should be withdrawn.

CLAIMS 1-10 18, 20, 22 AND 23 ARE NOVEL OVER SCHMIDT ET AL.

The Examiner has rejected the aforementioned claims under 35 U.S.C. §102(b) as allegedly being anticipated by Schmidt et al. Applicants strenuously disagree with the Examiner's position.

A rejection under §102(b) is warranted only when the cited reference identically discloses the subject matter of the invention as claimed. In re Bond, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). Applicants respectfully submit that the rejection under §102(b) is not warranted in this case because Schmidt et al. do not disclose an identical invention.

Specifically, the Examiner states that the claimed invention is anticipated by the YAC clones disclosed in Schmidt *et al.* (1995, *Science* **270**:480-483).

This references describes a vast number of YAC clones and their arrangement on chromosome 4. It does not explicitly identify any nucleic acid isolate that is capable of accelerating or delaying flowering time, there being no mention of such function. The claimed invention is directed to FRI nucleic acid encoding a polypeptide that delays or accelerates flowering time. It cannot fairly be said that this invention was "described in a printed publication", because the skilled person reading Schmidt *et al.* would not be made aware of nucleic acid encoding a polypeptide that delays or accelerates flowering time. Schmidt *et al.* contains no indication that the YAC clones contain any sequence capable of affecting flowering time and, based on Schmidt *et al.*, one skilled in the art has no reasonable chance of identifying such a sequence. The disclosure is still effectively under lock and key.

The Examiner states that "the FRI locus nucleic acid would be obtainable from the YAC clones". Practically

speaking, the nucleic acid is only obtainable because of the disclosure in the present application. In the prior art, one skilled in the art would not have obtained FRI locus nucleic acid from the YAC clone, because the prior art provided no indication that the claimed nucleic acids were was obtainable.

Similarly, claim 20 is independently novel because the claimed promoter sequence is not recognizably disclosed in Schmidt *et al*.

In light of the foregoing remarks, Applicants submit that the §102(b) rejection of claims 1-10, 18, 20, 22 and 23 is improper and should be withdrawn.

It is respectfully urged that this case be placed in condition for allowance. In the event the Examiner is not persuaded as to the allowability of any claim, and it appears that any outstanding issues may be resolved through a telephone interview, the Examiner is requested to telephone the undersigned attorney at the phone number give below. In the event a fee is required the Examiner is authorized to charge the deposit account of the undersigned 04-1406.

Respectfully submitted,
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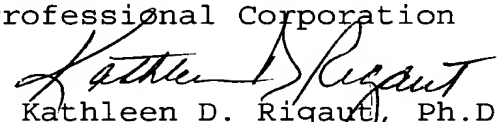
By 
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